10/100/1000 BASE-T Copper SFP Transceiver

SFP Series

- Up to 1.25 Gb/s bi-directional data links over CAT 5 cable
- Hot-pluggable SFP footprint
- Low power dissipation (1.05W typical)
- Compact RJ-45 connector
- Fully metal enclosure, for lower EMI
- RoHS compliant and lead-free
- Single +3.3V power supply
- 10/100/1000 BASE-T operation in host systems with SGMII interface

ASCENT'S SFP-AG-CO-04 10/100/1000 BASE-T Copper Small Form Pluggable (SFP) transceivers are based on the SFP Multi Source Agreement (MSA).

They are compatible with the Gigabit Ethernet standards as specified in IEEE 802.3-2002 and IEEE 802.3ab, and the module supports 1000 Mbps data rates at ranges up to 100 m over twisted-pair Cat 5 cables.

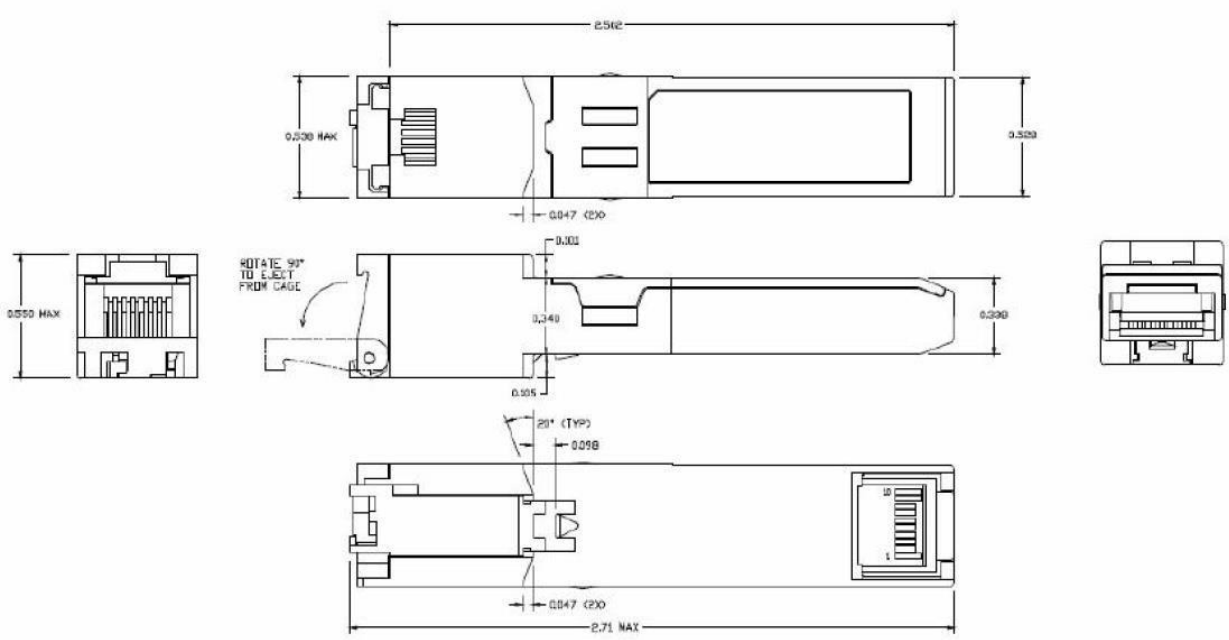
SFP-AG-CO-04 supports 1000 Mbps full duplex data links with 5-level Pulse Amplitude Modulation (PAM) signals. All four pairs in the cable are used with symbol rate at 250 Mbps on each pair.

The module provides standard serial ID information compliant with the SFP MSA, which can be access with address of A0h via the 2-wire serial CMOS EEPROM protocol. The physical layer IC can also be accessed via 2-wire serial bus at address A0h.

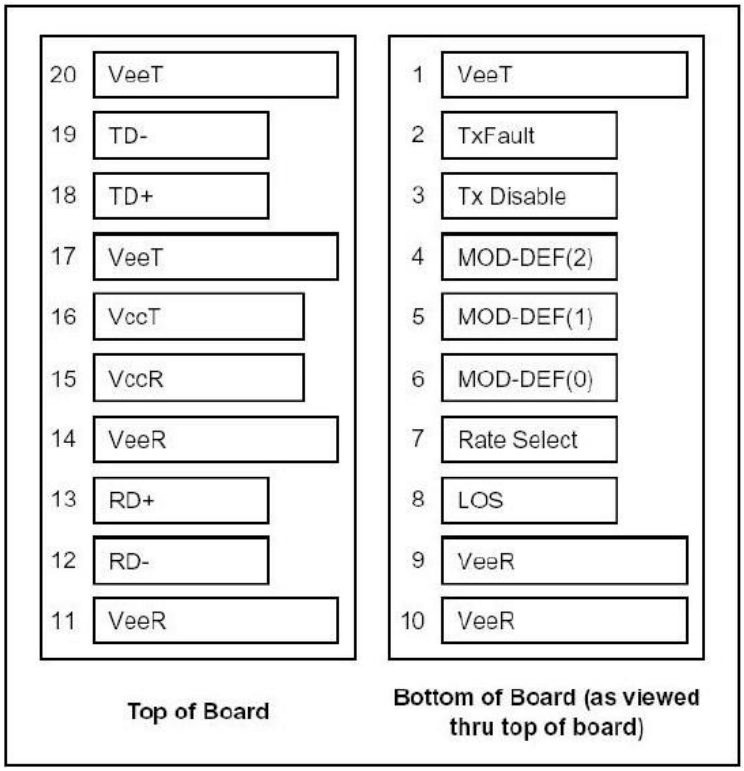
Key Features

- Up to 1.25 Gb/s bi-directional data links
- Hot-pluggable SFP footprint
- Low power dissipation (1.05W typical)
- Compact RJ-45 connector assembly
- Fully metal enclosure, for lower EMI
- RoHS compliant and lead-free
- Single +3.3V power supply
- 10/100/1000 BASE-T operation in host systems with SGMII interface
- Access to physical layer IC via 2-wire serial bus
- 1.25 Gigabit Ethernet over Cat 5 cable

Outline Diagram



Pin Descriptions



Pin	Symbol	Name/Description	Plug Seq.	Note
1	V_{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	1
3	TX DISABLE	Transmitter Disable	3	2
4	MOD_DEF(2)	SDA Serial Data Signal	3	3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	3
6	MOD_DEF(0)	TTL Low	3	3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	4
9	V_{EER}	Receiver Ground	1	
10	V_{EER}	Receiver Ground	1	
11	V_{EER}	Receiver Ground	1	
12	RX-	Inv. Received Data Out	3	5
13	RX+	Received Data Out	3	5
14	V_{EER}	Receiver Ground	1	
15	V_{CCR}	Receiver Power Supply	2	
16	V_{CCT}	Transmitter Power Supply	2	
17	V_{EET}	Transmitter Ground	1	
18	TX+	Transmit Data In	3	6
19	TX-	Inv. Transmit Data In	3	6
20	V_{EET}	Transmitter Ground	1	

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1. TX Fault is an open collector output, which should be pulled up with a 4.7 kΩ to 10 kΩ resistor on the host board to a voltage between 2.0 V and Vcc + 0.3 V. Logic 0 indicates normal operation; logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8 V.
2. TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 kΩ to 10 kΩ resistor. Its states are:

   Low (0 V to 0.8 V): Transmitter On
   (>0.8 V, <2.0 V): Undefined
   High (2.0 V to 3.465 V): Transmitter Disabled
   Open: Transmitter Disabled
3. Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7 kΩ to 10 kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.

   Mod-Def 0 is grounded by the module to indicate that the module is present
   Mod-Def 1 is the clock line of two wire serial interface for serial ID
   Mod-Def 2 is the data line of two wire serial interface for serial ID
4. LOS (Loss Of Signal) is an open collector/drain output, which should be pulled up with a 4.7 kΩ to 10 kΩ resistor. Pull up voltage between 2.0 V and VccT, R + 0.3 V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8 V.
5. RD-/+: These are the differential receiver outputs. They are AC coupled 100 differential lines which should be terminated with 100 (differential) at the user SERDES.
6. TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential termination inside the module.

Specifications

3.3 V Volt Electrical Power Interface

The SFP-AG-CO-04 has an input voltage range of 5 V ± 5%. The 3.3 V maximum voltage is not allowed for continuous operation.

Parameter	Symbol	Min	Typ	Max	Unit	Notes/Conditions
Supply Current	Is		320	375	mA	1.2W max power over full range of voltage and temperature. See caution note below
Input Voltage	Vcc	3.13	3.3	3.47	V	Referenced to GND
Maximum Voltage	Vmax			4	V	
Surge Current	Isurge			30	mA	Hot plug above steady state current. See caution note below

Caution: Power consumption and surge current are higher than the specified values in the SFP MSA

Low-Speed Signals, Electronic Characteristics

MOD_DEF(1) (SCL) and MOD_DEF(2) (SDA), are open drain CMOS signals (see section VII, "Serial Communication Protocol"). Both MOD_DEF(1) and MOD_DEF(2) must be pulled up to host_Vcc

Parameter	Symbol	Min	Max	Unit	Notes/Conditions
SFP Output LOW	VOL	0	0.5	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Output HIGH	VOH	host_Vcc - 0.5	host_Vcc + 0.3	V	4.7k to 10k pull-up to host_Vcc, measured at host side of connector
SFP Input LOW	VIL	0	0.8	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector
SFP Input HIGH	VIH	2	Vcc + 0.3	V	4.7k to 10k pull-up to Vcc, measured at SFP side of connector

High-Speed Electrical Interface, Transmission Line-SFP

All high-speed signals are AC-coupled internally.

Parameter	Symbol	Min	Typ	Max	Unit	Notes/Conditions
Line Frequency	fL		125		MHz	5-level encoding, per IEEE 802.3
Tx Output Impedance	Zout,TX		100		Ω	Differential, for all frequencies between 1 MHz and 125 MHz
Rx Input Impedance	Zin,RX		100		Ω	Differential, for all frequencies between 1 MHz and 125 MHz

High-Speed Electrical Interface, Host-SFP

Parameter	Symbol	Min	Typ	Max	Unit	Notes/Conditions
Single-Ended Data Input Swing	Vinsing	250		1200	mV	Single-ended
Single-Ended Data Output Swing	Voutsing	350		800	mV	Single-ended
Rise/Fall Time	Tr,Tf		175		psec	20 % - 80 %
Tx Input Impedance	Zin		50		Ω	Single-ended
Rx Output Impedance	Zout		50		Ω	Single-ended

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Notes/Conditions
Data Rate	BR	10		1000	Mb/sec	IEEE 802.3 compatible. See Notes 2 through 4 below
Cable Length	L			100	m	Category 5 UTP. BER <10^{-12}

Notes:

1. Clock tolerance is ± 50 ppm
2. By default, the SFP-AG-CO-04 is a full duplex device in preferred master mode
3. Automatic crossover detection is enabled. External crossover cable is not required

4. 10/100/1000 BASE-T operation requires the host system to have an SGMII interface with no clocks, and the module PHY to be configured per Application Note AN-2036. With a SERDES that does not support SGMII, the module will operate at 1000BASE-T only

Environmental Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Notes/Conditions
Case Operating Temperature	Tcase	0		70	°C	
Storage Temperature	Tsto	-40		85	°C	Ambient temperature

Ordering Information

Product Model	Product Description
SFP-AG-CO-04	SFP Plug-in, 10/100/1000 Base T Copper, 1.25Gbps, 100m, Auto Negotiation, RJ45

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